IN THE CLAIMS:

Please amend claims 4-8 and 11-14 as follows.

1. (Original) A method for selecting a swapping technique from a group consisting of a bit-swapping and a gain-swapping techniques in a discrete multi-tone (DMT) system having multiple sub-channels, gain factor constraints, a threshold index value (T), and a maximum mean square error (MSE_{max}) and a minimum mean square error (MSE_{min}), the method comprising:

determining a first index value (I) and a second index value (J) based on MSE_{max}, MSE_{min} and said gain factor constraints according to a predetermined manner, I denoting range of improvement when adopting the gain-swapping as the swapping technique, and J denoting range of improvement when adopting a combination of the gain-swapping and the bit-swapping as the swapping technique; determine whether larger one of I and J is larger than T;

if larger one of I and J is larger than T, determining whether I is equal to or larger than J; and selecting the gain-swapping as the swapping technique if I is equal to or larger than J.

1. (Original) The method as recited in claim 1, further comprising a step of

selecting a combination of gain-swapping and bit-swapping as the swapping technique if I is smaller than J.

2. (Currently Amended) The method as recited in claim 1, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, said predetermined manner comprises the steps of:

obtaining a ~~first~~ gain margin value (Gmv~~1~~) by subtracting g_{max} from Gcm, and obtaining ~~an second~~ another gain margin value (Gmv'~~2~~) by subtracting Gcn from g_{min};

obtaining a ~~first~~ parameter (P~~1~~) by subtracting MSE_{min} from MSE_{max}; and

obtaining the I by doubling a smallest one of the group consisting of Gmv~~1~~, Gmv'~~2~~ and (0.5*P~~1~~).

3. (Currently Amended) The method as recited in claim 1, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denotes an arithmetic average of MSE_{max} and MSE_{min} after bit-swapping and MSE_{maxbs} denotes MSE_{max} after bit-swapping and MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~third~~ gain margin value (Gmv $_b$~~3~~) by subtracting Gcn from g_{max}, and obtaining ~~a fourth~~ another gain margin value (Gmv'$_b$~~4~~) by subtracting g_{min} from Gcm; obtaining a ~~second~~ parameter (P~~2~~) by subtracting MSE_{maxbs} from MSE_{minbs};

obtaining ~~an third~~ another parameter (P'~~3~~) by subtracting MSE_{maxbs} and a smallest one of the group, consisting of Gmv $_b$~~3~~, Gmv'$_b$~~4~~ and (0.5*P~~2~~), from MSE_{avgbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'~~3~~) from MSE_{max}.

4. (Currently Amended) The method as recited in claim 1, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denoted the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping and MSE_{maxbs} denotes MSE_{max} after bit-swapping and

MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is not smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~fifth~~ gain margin value (Gmv~~5~~) by subtracting g_{max} from Gcm, and obtaining ~~an sixth~~ another gain margin value (Gmv'_~~6~~) by subtracting Gcn from g_{min};

obtaining a ~~fourth~~ parameter (P4) by subtracting MSE_{minbs} from MSE_{maxbs};

obtaining ~~an fifth~~ another parameter (P'_~~5~~) by subtracting MSE_{avgbs} and a smallest one of the group, consisting of Gmv~~5~~, Gmv'_~~6~~ and (0.5*P4), from MSE_{maxbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'_~~5~~) from MSE_{max}.

5. (Currently Amended) The method as recited in claim 1, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denotes the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping, MSE_{maxbs} denotes MSE_{max} after bit-swapping, MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~seventh~~ gain margin value (Gmv_{b}~~7~~) by subtracting Gcn from g_{max}, and obtaining ~~an eighth~~ another gain margin value (Gmv'_~~b~~~~8~~) by subtracting g_{min} from Gcm;

obtaining a ~~sixth~~ parameter (P~~6~~) by subtracting MSE_{maxbs} from MSE_{minbs};

obtaining ~~an seventh~~ another parameter (P'_~~7~~) by subtracting a smallest one of the group, consisting of Gmv_{b}~~7~~, Gmv'_~~b~~~~8~~ and (0.5*P~~6~~), and MSE_{avgbs} from MSE_{minbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'_~~7~~) from MSE_{max}.

6. (Currently Amended) The method as recited in claim 1, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes

the gain of the channel respecting MSE_{min}, MSE_{avgbs} denotes the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping, MSE_{maxbs} denotes MSE_{max} after bit-swapping, MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is not smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~ninth~~ gain margin value (Gmv~~9~~) by subtracting g_{max} from Gcm, and obtaining ~~an tenth~~ another gain margin value (Gmv'~~10~~) by subtracting Gcn from g_{min};

obtaining a ~~eighth~~ parameter (P~~8~~) by subtracting MSE_{minbs} from MSE_{maxbs};

obtaining ~~an ninth~~ another parameter (P'~~9~~) by subtracting MSE_{minbs} and a smallest one of the group, consisting of Gmv~~9~~, Gmv'~~10~~ and (0.5*P~~8~~), from MSE_{avgbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'~~9~~) from MSE_{max}.

7. (Currently Amended) A method for performing gain-swapping in a discrete multi-tone (DMT) system having multiple sub-channels, gain factor constraints, and a maximum mean square error (MSE_{max}) and a minimum mean square error (MSE_{min}), wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the channel respecting MSE_{min}, said method comprising the steps of:

obtaining ~~an eleventh~~ gain margin value (Gmv~~11~~) by subtracting g_{max} from Gcm, and obtaining ~~an twelfth~~ another gain margin value (Gmv'~~12~~) by subtracting Gcn from g_{min};

obtaining a ~~tenth~~ parameter (P~~10~~) by subtracting MSE_{min} from MSE_{max};

obtaining the value MIN of the smallest one of the group consisting of Gmv~~11~~, Gmv'~~12~~ and (0.5*P~~10~~); and

adding gain in amount of MIN to the sub-channel having MSE_{max} and subtracting gain in amount of MIN from the sub-channel having MSE_{min}.

8. (Original) A swapping technique selector for selecting an optimal swapping technique from a group consisting of a bit-swapping and a gain-swapping techniques in a discrete multi-tone (DMT) system having multiple sub-channels, gain factor constraints, and a threshold index value (T) and a maximum mean square error (MSE_{max}) and a minimum mean square error (MSE_{min}), the swapping technique selector comprising:

a performance improvement pre-calculator for determining a first index value (I) and a second index value (J) based on MSE_{max}, MSE_{min} and said gain factor constraints according to a predetermined manner, I denoting range of improvement when adopting the gain-swapping as the optimal swapping technique, and J denoting range of improvement when adopting a combination of the gain-swapping and the bit-swapping as the optimal swapping technique;

a threshold comparator, connected to the performance improvement pre-calculator, for determining whether larger one of I and J is larger than T;

a performance improvement comparator, connected to the threshold comparator, for selectively determining whether I is equal to or larger than J; and

a swapping technique selection device, connected to the performance improvement comparator, for selecting either the gain-swapping or the combination of gain-swapping and bit-swapping as the optimal swapping technique.

9. (Currently Amended) The selector of claim 9, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, said predetermined manner comprises the steps of:

obtaining a ~~first~~ gain margin value (Gmv~~1~~) by subtracting g_{max} from Gcm, and obtaining ~~an second~~ another gain margin value (Gmv'~~2~~) by subtracting Gcn from g_{min};

obtaining a ~~first~~ parameter (P~~1~~) by subtracting MSE_{min} from MSE_{max}; and

obtaining the I by doubling a smallest one of the group consisting of Gmv~~1~~, Gmv'~~2~~ and (0.5*P~~1~~).

10. (Currently Amended) The selector of claim 9, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denotes an arithmetic average of MSE_{max} and MSE_{min} after bit-swapping and MSE_{maxbs} denotes MSE_{max} after bit-swapping, and as MSE_{maxbs} is smaller than MSE_{avgbs}, the predetermined manner comprises the steps of: obtaining a ~~third~~ gain margin value (Gmv_b~~3~~) by subtracting Gcn from g_{max}, and obtaining ~~an fourth~~ another gain margin value (Gmv'$_b$~~4~~) by subtracting g_{min} from Gcm;

obtaining a ~~second~~ parameter (P~~2~~) by subtracting MSE_{maxbs} from MSE_{minbs};

obtaining ~~an third~~ another parameter (P'~~3~~) by subtracting MSE_{maxbs} and a smallest one of the group, consisting of Gmv_b~~3~~, Gmv'$_b$~~4~~ and (0.5*P~~2~~), from MSE_{avgbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'~~3~~) from MSE_{max}.

11. (Currently Amended) The selector of claim 9, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denoted the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping and MSE_{maxbs} denotes MSE_{max} after bit-swapping and MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is not smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~fifth~~ gain margin value ($Gmv_{~~5~~}$) by subtracting g_{max} from Gcm, and obtaining ~~an sixth~~ another gain margin value ($Gmv'_{~~6~~}$) by subtracting Gcn from g_{min};

obtaining a ~~fourth~~ parameter (P4) by subtracting MSE_{minbs} from MSE_{maxbs};

obtaining ~~an fifth~~ another parameter ($P'_{~~5~~}$) by subtracting MSE_{avgbs} and a smallest one of the group, consisting of $Gmv_{~~5~~}$, $Gmv'_{~~6~~}$ and (0.5*P4), from MSE_{maxbs}; and

obtaining the J by subtracting MSE_{min} and ($2*P'_{~~5~~}$) from MSE_{max}.

12. (Currently Amended) The selector of claim 9, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the sub-channel respecting MSE_{min}, MSE_{avgbs} denotes the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping, MSE_{maxbs} denotes MSE_{max} after bit-swapping, MSE_{minbs} denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~seventh~~ gain margin value ($Gmv_{b~~7~~}$) by subtracting Gcn from g_{max}, and obtaining ~~an eighth~~ another gain margin value ($Gmv'_{b~~8~~}$) by subtracting g_{min} from Gcm;

obtaining a ~~sixth~~ parameter (P~~6~~) by subtracting MSE_{maxbs} from MSE_{minbs};

obtaining ~~an seventh~~ another parameter ($P'_{~~7~~}$) by subtracting a smallest one of the group consisting of $Gmv_{b~~7~~}$, $Gmv'_{b~~8~~}$ and (0.5*P~~6~~) and MSE_{avgbs} from MSE_{minbs}; and

obtaining the J by subtracting MSE_{min} and ($2*P'_{~~7~~}$) from MSE_{max}.

13. (Currently Amended)The selector of claim 9, wherein the gain factor constraints have a maximum gain factor constraint (Gcm) and a minimum gain factor constraint (Gcn), g_{max} denotes the gain of the sub-channel respecting MSE_{max}, g_{min} denotes the gain of the channel respecting MSE_{min}, MSE_{avgbs} denotes the arithmetic average of MSE_{max} and MSE_{min} after bit-swapping, MSE_{maxbs} denotes MSE_{max} after bit-swapping, MSE_{minbs}

denotes MSE_{min} after bit-swapping, and as MSE_{maxbs} is not smaller than MSE_{avgbs}, the predetermined manner comprises the steps of:

obtaining a ~~ninth~~ gain margin value (Gmv~~9~~) by subtracting g_{max} from Gcm, and obtaining ~~an tenth~~ another gain margin value (Gmv'~~10~~) by subtracting Gcn from g_{min};

obtaining a ~~eighth~~ parameter (P~~8~~) by subtracting MSE_{minbs} from MSE_{maxbs};

obtaining ~~an ninth~~ another parameter (P'~~9~~) by subtracting MSE_{minbs} and a smallest one of the group consisting of Gmv~~9~~, Gmv'~~10~~ and (0.5*P~~8~~) from MSE_{avgbs}; and

obtaining the J by subtracting MSE_{min} and (2*P'~~9~~) from MSE_{max}.